J. Helminthol. Soc. Wash.
61(1), 1994, pp. 139–141

Research Note

Helminths of the Charal Prieto, *Chirostoma attenuatum* (Osteichthyes: Atherinidae), from Patzcuaro Lake, Michoacan, Mexico

G. PÉREZ-PONCE DE LEÓN, B. MENDOZA G., AND G. PULIDO F.
Laboratorio de Helmintología, Instituto de Biología, Universidad Nacional Autonoma de México, Ap. Postal 70-153, C.P. 04510, México D.F.

ABSTRACT: Eight helminth species (*Posthodiplostomum minimum, Allocreadium mexicanum, Bothriocephalus acheilognathi,* a cyclophyllidean cysticercoid, *Arhythmorhynchus brevis, Spinitectus carolini, Capillaria patzcuarensis,* and *Eustrongylides* sp.) were found in 195 fish, *Chirostoma attenuatum,* from Patzcuaro Lake from October 1989 to December 1990. *Posthodiplostomum minimum* had the highest prevalence and intensity. Our findings represent new host records.

KEY WORDS: *Chirostoma attenuatum,* charal prieto, *Posthodiplostomum minimum, Allocreadium mexicanum,* cyclophyllidean, *Bothriocephalus acheilognathi, Arhythmorhynchus brevis, Spinitectus carolini, Capillaria patzcuarensis, Eustrongylides* sp., helminths, Patzcuaro, Mexico.

Chirostoma attenuatum is an endemic atherinid fish from Patzcuaro Lake, and this and other species of the same genus have a commercial importance in fisheries of this lake. All species of *Chirostoma* are endemic to Mexico, and their taxonomy has been reviewed by Barbour (1973a, b). Osorio et al. (1986) previously recorded 8 helminth species as parasites of "white fish," *Chirostoma estor,* another endemic fish of Patzcuaro Lake. The purpose of this note is to describe the prevalence and intensity of the helminth fauna of *C. attenuatum.*

Fish were collected in Patzcuaro Lake, one of the largest lakes in Mexico, which is situated in the State of Michoacan, in southwest Mexico. The lake occupies 10% of an endorreic basin of tectovolcanic origin and has no outlet and no important water inlets. It is fed by temporary streams during the rainy season, May to October. It is in a eutrophication stage and has a total area of 130 km^2 and a mean depth of 4.97 m (Chacon et al., 1989).

From October 1989 to December 1990, 195 fish were collected by "spoon" and seine nets. Fish were kept frozen until their dissection 4 hr after capture. Digestive tract, viscera, mesentery, muscle, eyes, and brain were examined separately using a stereoscopic microscope. Trematodes and cestodes were fixed in Bouin's fluid with light coverglass pressure, stained in Harris or Delafield's hematoxylin, dehydrated, cleared in methyl salicylate, and mounted in Canada balsam. Acanthocephalans were kept in distilled water 6 hr at 4°C, fixed in 70% ethanol, and then stained and mounted as already described. Nematodes were fixed in hot 70% ethanol and were studied as temporary whole mounts cleared in lactophenol. Specimens were deposited in the Colección Helmintológica del Instituto de Biología de la UNAM México (IBUNAM) and in the U.S. National Museum Helminthological Collection, Beltsville, Maryland (USNM Helm. Coll.) as follows: *Posthodiplostomum minimum* (MacCallum, 1921) Dubois, 1936: IBUNAM No. 246-21; USNM Helm. Coll. No. 82105. *Allocreadium mexicanum* Osorio, Pérez, and Salgado, 1986: IBUNAM No. 248-13; USNM Helm. Coll. No. 82160. *Bothriocephalus acheilognathi* Yamaguti, 1934: IBUNAM No. II-269; USNM Helm. Coll. No. 82162. Cyclophyllidean cysticercoid: IBUNAM No. II-270; USNM Helm. Coll. No. 82161. *Arhythmorhynchus brevis* Van Cleave, 1916: IBUNAM No. II-271; USNM Helm. Coll. No. 82159. *Spinitectus carolini* Holl, 1928: IBUNAM No. 187-4; USNM Helm. Coll. No. 82163. *Eustrongylides* sp.: IBUNAM No. 187-5; USNM Helm. Coll. No. 82164. The ecological terms are used in accordance with Margolis et al. (1982).

The helminths include 8 species, 4 of them larval forms as well as 4 adults. The 4 larval forms—*P. minimum* metacercariae, cyclophyllidean cysticercoids, *A. brevis* cystacanths, and *Eustrongylides* sp. larvae—probably complete their life cycles in birds that feed on fish. We have found (unpubl. data) adults of *P. minimum* and *A. brevis* in several bird species of the family Ardeidae, but we have been unable to find adults of the cyclophyllidean cysticercoids and *Eustrongylides* sp. larvae in their natural hosts. Because of the small number of larvae of those species found here, we could not feed larval forms to an experimental definitive host to get the adult worms. The presence of cyclophyllidean cysti-

Table 1. Helminths of the charal prieto, *Chirostoma attenuatum*, in Patzcuaro Lake, Michoacan, Mexico, $N = 195$.

Helminth	Site*	Prevalence (%)	Intensity ($\bar{x}$)
Trematoda			
Posthodiplostomum minimum (Metacercariae)	L, M, Me, E, B	98.4	111.3
Allocreadium mexicanum	I	4.1	2.9
Cestoda			
Bothriocephalus acheilognathi	I	6.7	3.5
Cyclophyllidea (Cysticercoid)	I	0.5	8.0
Acanthocephala			
Arhythmorhynchus brevis (Cystacanths)	L, Me	3.6	2.8
Nematoda			
Spinitectus carolini	I	14.3	2.9
Capillaria patzcuarensis	I	0.5	1.0
Eustrongylides sp. (larvae)	Me	1.5	1.3

* B = brain, E = eyes, I = intestine, L = liver, M = muscle, Me = mesentery.

cercoids in fish has been documented by several authors; Olsen (1939) found minute cysticercoids of *Dendrouterina nycticoracis* in the gall bladder of the fish *Ameiurus melas* in Minnesota, U.S.A.

Prevalence and mean intensity for each helminth species in the host sample are given in Table 1. *Posthodiplostomum minimum* had the highest prevalence (98.4%) and mean intensity (111.3) of infection. We found a total of 21,399 larvae of this diplostomid from liver, muscle, mesentery, eyes, and brain, with highest numbers found in the liver. Other helminths, in diminishing order of prevalence, were *S. carolini, B. acheilognathi, A. mexicanum,* and *A. brevis.* The lower values of prevalence and intensity for the cyclophyllidean cysticercoids, *Eustrongylides* sp. larvae, and *Capillaria patzcuarensis* suggest that they may be sporadic or accidental infections.

None of the parasites found in this study is unique to *C. attenuatum,* but each represents a new host record. The population of *C. attenuatum* examined is sympatric with the population of *C. estor.* Thus, it is not unexpected that these populations should share some of the same helminth species; actually, they share 7 helminth species when our results are compared to those of Osorio et al. (1986) in *C. estor.*

The high prevalences of *P. minimum* in freshwater fish of North America are well documented (Meade and Bedinger, 1967; Spall and Summerfelt, 1969; McDaniel and Bailey, 1974; Sutherland and Holloway, 1979; Ingham and Dronen, 1980; Amin, 1982; Threlfall and Watkins, 1982; Bailey, 1984) and are in agreement with our findings. This trematode may produce severe damage to its host, and this is an aspect to be evaluated in the future.

We thank J. Ralph Lichtenfels from the Biosystematic Parasitology Laboratory, Beltsville, Maryland, for his advice on this manuscript; Rafael Lamothe for the review and comments on this manuscript; and Patricia Ramos, Rocio Hernández, and Ma. Antonieta Arizmendi for their assistance with the fieldwork. Luis García Prieto assisted in the field as well as with laboratory work and gave technical advice. Araceli Orbe permitted us to use the field facilities in CRIP–Patzcuaro. This research was supported by the Programa de Apoyo a las Divisiones de Estudios de Posgrado (PADEP–UNAM) Nos. DFC9002 and DFC9148. The comments and suggestions of 2 anonymous reviewers are greatly appreciated.

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J. Helminthol. Soc. Wash.
61(1), 1994, pp. 141–145

Research Note

Persistence of the Component Parasite Community of Yarrow's Spiny Lizard, *Sceloporus jarrovii*, 1967–1991

CHARLES R. BURSEY[1] AND STEPHEN R. GOLDBERG[2]

[1] Department of Biology, Pennsylvania State University, Shenango Campus, 147 Shenango Avenue, Sharon, Pennsylvania 16146 and

[2] Department of Biology, Whittier College, Whittier, California 90608

ABSTRACT: Persistence of the component parasite community of *Sceloporus jarrovii* was examined from samples taken 22 yr apart. Of the nematodes recovered, *Spauligodon giganticus* represents a core species; *Physaloptera retusa, Thubunaea intestinalis, Oochoristica scelopori,* and *Mesocestoides* sp. are satellite species. Species composition, prevalences, and intensities were similar after 22 yr, suggesting a persistent helminth component community.

KEY WORDS: *Sceloporus jarrovii,* Phrynosomatidae, *Physaloptera retusa, Spauligodon giganticus, Thubunaea intestinalis, Oochoristica scelopori, Mesocestoides* sp., helminth community.

Parasite community structure is hierarchical: a parasite infrapopulation represents all members of a single species of parasite within an individual host (Esch et al., 1975), a parasite infracommunity includes all of the infrapopulations within an individual host (Bush and Holmes, 1986), and a component parasite community represents all of the infracommunities within a given host population (Holmes and Price, 1986). A component parasite community is composed of core species, those species that occur with relatively high frequencies (prevalences) and densities (mean intensities), and satellite species, which occur with less frequency and are relatively less numerous than core species (Hanski, 1982).

Persistence, a measure of continued presence, and stability, a measure of constancy over time (see Meffe and Minckley, 1987), of helminth infections in lizards have been infrequently reported (Telford, 1970; Goldberg and Bursey, 1990b; Bursey and Goldberg, 1991, 1992). In this note, we present data on the component helminth community in samples taken 22 yr apart from a population of Yarrow's spiny lizard, *Sceloporus jarrovii* Cope. This phrynosomatid lizard (see Frost and Etheridge, 1989, for revised taxonomy of iguanian lizards) is restricted to the mountains of southeastern Arizona (Stebbins, 1985). Goldberg and Bursey (1990a) provided a list of the helminth fauna of *Sceloporus jarrovii.*

Specimens of *Sceloporus jarrovii* were collect-